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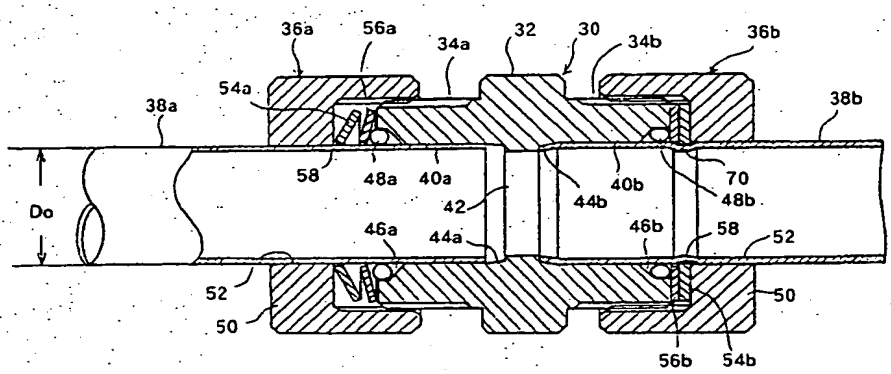
(54) Conduit coupling.

(57) A locking washer 54a formed in a conical shape and a seal retainer 56a are disposed between a coupling member 30 and the internally oriented flange 50 of a fastening nut 36a. These locking washer 54a and seal retainer 56a are placed so that an outer periphery thereof is positioned on the side of said coupling member, while an internal periphery thereof positioned on the internal surface of said fastening nut, when no external force is applied on said locking washer. When the fastening nut 36a is screwed to be tightened on said coupling member, the internal periphery of the locking washer 54a having recesses is reduced with its diameter, and the locking washer 54a together with the locking washer 54a urge the tubular conduit 38a into the coupling member 30 and grippingly deformably retain the conduit as indicated by the locking washer 54b. The conduit coupling of the invention is effectively applicable for any conduit formed of rigid metal or flexible plastic material.

FIG.1



EP 0 666 446 A1

SUMMARY OF THE INVENTION

An object of the present invention is to provide a conduit coupling in which any conduit formed of a rigid metal or non-rigid plastic material can be easily joined to each other.

Another object of the present invention is to provide a conduit coupling which is improved in higher anti-retraction strength at the coupling position of conduits.

A further object of the present invention is to provide a conduit coupling in which liquid accumulation is prevented.

The invention has been made on the basis of a variety of experiences and reviews by the inventor over several tens years, and also based on a new conception extremely advanced and different from the conception which was known as a common knowledge in the past, that, "originally the use of a conical spring member for the conduit coupling is effective only in the limited case thereof, where the conduit is to be inserted especially from the enlarged diameter end thereof", as is disclosed in the laid-open Utility Model Publication No. 61-181184. To achieve the afore-mentioned objects of the invention, the conduit coupling comprises: a coupling member having an entry bore and an external male thread; a fastening nut having a flanged portion with a central opening and a female thread to mesh with the thread of coupling member; and a locking washer formed as a conical spring washer having a central opening whose dimension can be reduced when axially compressed, the opening having a plurality of recesses to form a plurality of tabs; the locking washer being placed so that an outer periphery thereof is positioned on the side of the coupling member, while an internal periphery thereof positioned on the internal surface of the fastening nut, when no external force is applied on the locking washer; and locking washer being applied with an axial force, when screwed on the coupling member, and having the central opening reduced with its dimension to firmly lock the conduit and secure the conduit to the coupling member.

The locking washer is preferably formed of a resilient material. At the entry bore of coupling member, a seal recess for a seal member such as an O-ring may be provided. Further preferably, a seal retainer of a conical spring, provided between the coupling member and the locking washer, is disposed so that the outer and internal peripheries thereof are oriented toward the coupling member and the locking washer, respectively. In addition, an internal stopper portion may be formed within the coupling member for receiving the end of the inserted conduit. Also, the entry bore of the coupling member may be formed so that the end of the stopper is reduced in diameter as approached to the stopper portion.

When fastening nut is tightened with the coupling member, locking washer, interposed between coupling member and fastening nut, and compressed in the axial direction, the diameter of the internal opening of the washer gradually decreases. As a result, the washer is firmly engaged with the external surface of conduit. After the conduit is secured to the coupling member, rather a greater force is necessary to separate both members from each other, and a higher amount of anti-retraction strength is obtained. Further, for this purpose, a particular machining or the like is not required on the end area of the conduit to provide a simplified connection. The locking washer, although deformably engages around the conduit, would not deform it in excess over the extent necessary to retain the rigid metal made conduit, and the same manner is also applicable for retaining a conduit of a non-rigid material such as of plastic or rubber. Also, as the locking washer, when no external force is applied thereon, is positioned so that the outer periphery thereof is oriented toward the coupling member, while the internal periphery is oriented toward the fastening nut. Therefore, upon release of the fastening nut, the fastening nut is returned to the condition inclined toward the withdrawing direction, thereby making ease of withdrawal of the conduit out of the coupling member and of maintenance and inspection.

The locking washer and seal retainer, formed of a resilient material and fastened by the fastening nut, apply an axial force on the coupling member and fastening nut, to prevent looseness therebetween. Especially, by forming the coupling member and fastening nut with stainless steel or the like and the locking washer and seal retainer with a anti-corrosive spring material, it is possible to obtain a conduit coupling durable over fully 30 years.

The object of providing a seal retainer in addition to the fastening washer is to completely prevent fluid leak due to pressure or also to vibration by the same conception of providing an O-ring packing between flanges which are tightened to a predetermined extent by means of bolts. Such a seal retainer also serves to protect the seal member from being damaged by the edge of recess of the washer, and to prevent leak of even a highly pressurized fluid. A seal retainer formed as a conical spring is also disposed as its outer and internal peripheries are oriented in the same condition as using the locking washer stated above. As the seal retainer acts to press the O-ring into the recess from the end surface of coupling member to prevent the O-ring from swelling out of the recess, the O-ring is prevented from damage but is not pressed in excess than necessary, thereby neither

washer 54 and a seal retainer 56 are fitted. As shown in the left side of FIG.1, the locking washer 54 and retainer 56 are positioned, when freed from an axial force, so that each inner fringe of both members rests on the inner bottom surface within the fastening nut 36, while the outer fringe thereof is oriented toward the end of tubular conduit 38. After placing an O-ring in a recess 46, the end of a tubular conduit 38 is inserted into a bore 40 of coupling member 30 until the end of tubular conduit 38 abuts against the front edge of tapered area 44 of the coupling member 30. Thereafter, the female thread of fastening nut 36 is meshed with the male thread 34 of coupling member 30, and fastening nut 36 is tightened, whereby locking washer 54 and seal retainer 56 are urged by a axial force by coupling member 30 and fastening nut 36, and the freed shape of locking washer 54a and seal retainer 56a are radially pressed and turned to the deformed shape shown as the washer 54b and retainer 56b as illustrated on the right side of FIG.1.

Because the inner periphery of locking washer 54 engages the inner surface of the fastening nut 36, the internal periphery of locking washer 54a is reduced with its diameter to lockingly hold the tubular conduit 38 as the fastening nut 36 is gradually screwed, and the free end of tubular conduit 38a is narrowed and urged to enter the tapered portion 44a. In this process, the fastening nut 36 is locked to the tubular conduit 38, while the coupling member 30 is actually displaced relative to the conduit 38 and advances into the coupling member 30. Pressed by the internal periphery of locking washer 54, a reduced diameter portion 70 is formed around the tubular conduit 38, and the seal retainer 56, by radially urged, serves to produce the completed seal condition of the O-ring 48 which is completely confined within the recess 46a as shown by the numeral 48b.

Thus, the tubular conduit 38b is supported by the three-point suspension, comprising the tapered conduit portion 44b, locking washer 54b and fastening nut 36b, to achieve a rigid and stable connection of the conduit. Further, the locking washer 54 together with seal retainer 56 provides an axial, accordingly thrust force on the coupling member 30 and fastening nut 36 toprevent these members from any looseness. Accordingly, by appropriately selecting the material of the members including coupling member 30, fastening nut 36, locking washer 54, seal retainer 56 and O-ring 48, even the requirement of exceeding fully 30 years durability as achieved by the piping of a thin stainless steel construction can be satisfied. Therefore, the conduit connection of the invention, even applied to the piping in the building subject to various external oscillations caused by an earthquake or the like, is in its function durable against various oscillations, and the seal ability is maintained for a long period of time. In addition, upon releasing the fastening nut 36, the locking washer 54 together with seal retainer 56 release the tubular conduit 38, thereby tubular conduit 38 growing to be easily removed from coupling member 30 as shown in FIG.1, on the left side.

As the seal retainer 56 acts to press the O-ring 48 into the recess 46 over the end surface of coupling member 30 to prevent the O-ring 48 from swelling out of the recess 46, the O-ring 46 is prevented from damage but is not pressed in excess than necessary, thereby neither durability nor seal ability of O-ring 48 being affected. Further, a gap and also a fluid deposition therein which can be caused between the stopper 42 and the end of tubular conduit 38 is prevented, because the tubular conduit 38 is forced to engage the edge of the stopper portion 46, when the locking washer 54 firmly grips the tubular conduit 38. Also, because no special machining on the end of tubular conduit 38 is needed, both a conduit formed of rigid material, such as metal, and a flexible conduit such as formed of plastic or rubber can be easily joined. Further, the construction of locking washer 54 having its inner periphery formed as tapered and having a gradually increased diameter toward the entry side of tubular conduit 38 serves as the insertion guide for tubular conduit 38, and therefore, only by releasing the fastening nut 36, the tubular conduit 38 and coupling member 30 are easily joined to or removed from each other.

Among embodiments of a fastening nut 36 shown in FIGS. 3 to 5, an embodiment shown in FIG.3(a) includes a locking washer 54 having its internal periphery formed in an arcuate shape in order not to scratch the tubular conduit 38 when gripped by locking washer 54. In addition, FIG.3(b) shows another embodiment, in which the internal periphery of locking washer 54 is shaped as a wedge so that the fastening nut 36 becomes larger than the coupling member 30 in dimension, to facilitate gripping into tubular conduit 38, thereby increasing holding ability performed by locking washer 54. In the embodiment, the coupling member 30 has no provision which corresponds to the reduced diameter portion 44.

Another embodiment of a locking washer 54 shown in FIG.4 have its outer periphery formed to have a flat flanged portion 72, and provides the same effect as stated above. Still another locking washer 54 shown in FIG.5 is formed such that the width of the recess 74 is gradually reduced as approached to its outer end. The periphery of the recess 74 formed with a smoothed curve serves to prevent breakdown of the washer caused by a concentrated force applied thereon. Using a locking washer 54 of such a configuration, it is possible to

rality of recesses to form a plurality of tabs:

said locking washer 54 being placed so that an outer periphery thereof is positioned on the side of said coupling member, while an internal periphery thereof positioned on the internal surface of said fastening nut, when no external force is applied on said locking washer; and locking washer 54 being applied with an axial force, when screwed on said coupling member, and having said central opening reduced with its dimension to firmly lock said conduit and secure the conduit to said coupling member.

2. A conduit coupling according to claim 1: wherein said locking washer being formed of a resilient material.

3. A conduit coupling according to claim 1 or 2, further comprising:

a seal receiving recess formed at the entry bore of said coupling member for receiving a seal member; and

a seal retainer disposed between said coupling member and said locking washer for retaining said seal member.

4. A conduit coupling according to claim 3, wherein said seal retainer 56 being formed in the form of a conical spring, and placed so that an outer periphery thereof is positioned on the side of said coupling member, while an internal periphery thereof positioned on the internal surface of said fastening nut, when no external force is applied on said locking washer.

5. A conduit coupling according to one of claims 1 to 4, wherein said coupling member 30 having a stopper portion with which an end of said conduit engages, and the side end of said stopper portion being an internal reduced diameter portion which has a diameter gradually reducing as approached toward said stopper portion.

6. A conduit coupling according to any one of claims 1, 3, 4 and 5, wherein said coupling member having formed with an entry bore for receiving an end of a tubular conduit and a threaded portion.

7. A conduit coupling according to any one of claims 1, 3, 4 and 5, wherein any arbitrary one of the forms including an I-type, an L-type, and a three-directional type.

FIG.2 (a)

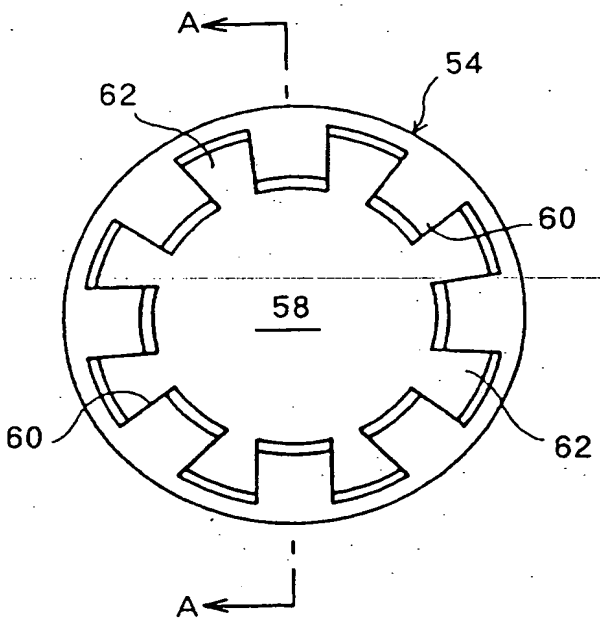


FIG.2 (b)

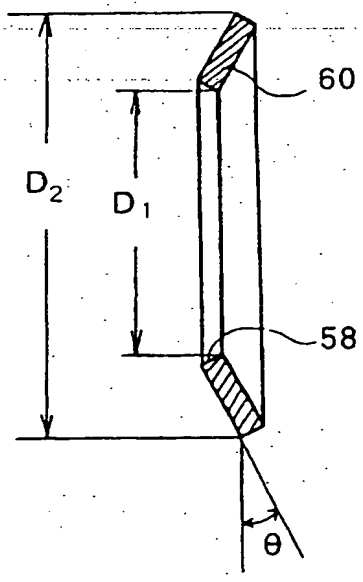


FIG.4

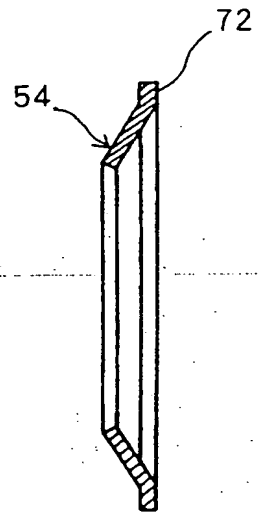


FIG.5

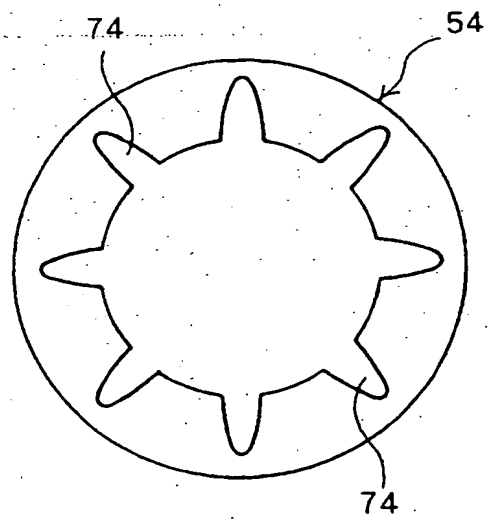


FIG.7 (a)

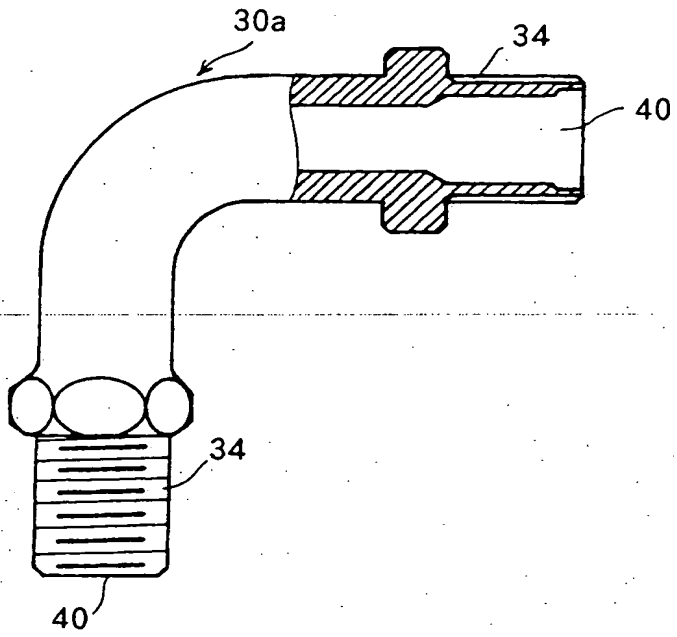


FIG.7 (b)